



Alt & Witzig Engineering, Inc.

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September 15, 2017

SFA Architects
300 West Fourth Street
Cincinnati, Ohio 45202
ATTN: Mr. Scott Kyle

RE: Subsurface Investigation &
EPA Retaining Wall
26 Martin Luther King Drive
Cincinnati, Ohio
Alt & Witzig File: 17CN0232

Dear Mr. Kyle:

In compliance with your request, we have completed a geotechnical investigation and evaluation for the above referenced project. It is our pleasure to transmit herewith a digital copy of our report. The purpose of this subsurface investigation was to evaluate the existing soil conditions behind the existing retaining wall at the western end of the EPA property in Cincinnati, Ohio.

Field Investigations

The subsurface investigation included reconnaissance of the project site, drilling 3 soil borings in the vicinity of the wall, performing standard penetration tests, and obtaining soil samples retained in the standard split-spoon sampler. The apparent groundwater level at the boring location was also determined. Borings were laid out as shown in figure 1.

The soil borings were performed with a conventional drilling rig equipped with a rotary head. Conventional hollow-stem augers were used to advance the holes. Representative samples were obtained employing split-spoon sampling procedures in accordance with ASTM Procedure D-1586.

During the sampling procedure, standard penetration tests were performed at regular intervals to obtain the standard penetration value of the soil. The standard penetration value is defined as the number of blows of a 140-pound hammer, falling 30 inches, required to advance the split-spoon sampler 1 foot into the soil. The results of the standard penetration tests indicate the relative density and comparative consistency of the soils, and thereby provide a basis for estimating the relative strength and compressibility of the soil profile components.

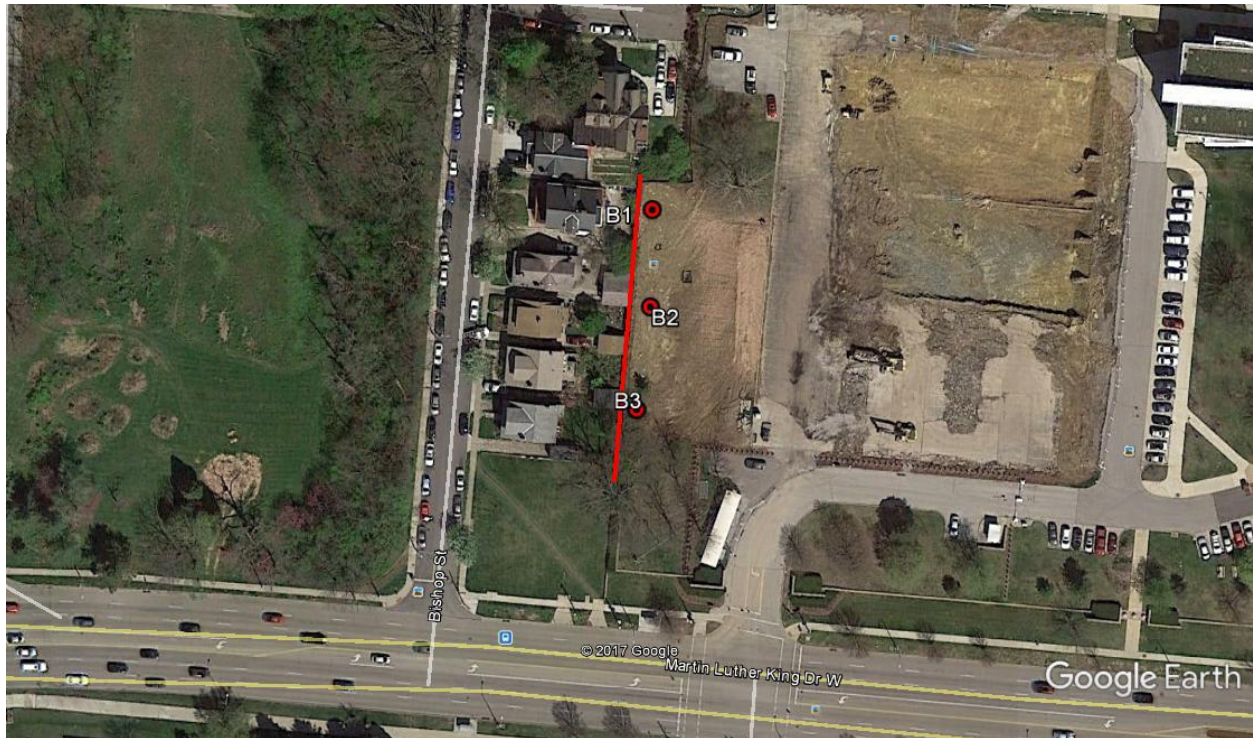


Figure 1: Boring Locations Behind Existing Retaining Wall

Laboratory Testing

The types of soils encountered in the boring were visually classified according to ASTM methods and are described in detail on the boring log. Representative samples of the soils encountered in the field were placed in sample jars and are now stored in our laboratory. Unless notified to the contrary, all samples will be disposed of after 30 days.

Project Description

At the time of drilling operations, a retaining wall resides at the eastern perimeter of the EPA property. The walls an unbalanced fill of up to approximately 8 feet from the EPA property to residential property to the west. The purpose of our report is to evaluate the soil conditions related to the retained and foundation conditions of the wall.

Subsurface Conditions

Similar soil layers were encountered across the site, but the thickness of the soil layers encountered at each boring location was found to vary slightly. The following table provides the typical soil profile encountered on the site.

Soil Description	Approximate Depth to Bottom of Soil Layer	Soil Consistency
Existing Fill Soils (Brown Clay with Organic Matter and Construction Debris)	8.5' - 12.0'	Soft to Stiff
Brown Clay/Sandy Clay	21'+	Medium Stiff to Very Stiff

All borings encountered dry conditions at completion with the exception to boring B-2. Boring B-2 encountered groundwater during drilling at a depth of 20 feet below the existing ground surface. Note that the groundwater table is difficult to accurately measure during short term observation periods, such as during boring observations. The actual elevation of the groundwater table is expected to fluctuate based on seasonal variations.

Retaining Wall Discussions

At the time of this report, it is unknown if or how the wall will be altered. If the wall is altered, the following parameters can be used for design. However, AWE should be consulted once further design plans are generated.

Depth	Soil Type	Cohesion/ Shear Strength (psf)	Total Unit Weight (pcf)	Angle of Internal Friction	K_a
0 to 12'	Existing Fill Soils (Brown Clay with Organic Matter and Construction Debris)	0	115	20°	0.49
12+	Native Soils (Brown Clay/Sandy Clay)	100	125	26°	0.39

According to the OSHA Construction Standards for Excavations, the shallow soils classify as Type C soils. Therefore, unbraced excavations to a maximum of 20 feet should be maintained at a 1.5:1 (H:V) slope or shallower in the cohesive soils. Any excavation greater than 20 feet in depth must be designed by a registered engineer. All shoring should be performed in accordance with applicable OSHA standards.

Groundwater was encountered at a depth of 20 feet below the surface during drilling. Based on our observations, any groundwater infiltration in short term excavation can likely be managed with sump pumps or sump pits. However, deeper excavations that are left open overnight may experience greater difficulties with groundwater infiltration.

Often, additional considerations in regards to the soil conditions arise during design and construction. If we can give further service in these matters, please contact us at your convenience.

Respectfully Submitted,

ALT & WITZIG ENGINEERING, INC.



Dustin Horn
Dustin M. Horn, P.E.
Project Engineer

Patrick A. Knoll

Patrick A. Knoll, P.E.
Principal Engineer

APPENDIX



BORING LOG

Alt & Witzig Engineering, Inc.

CLIENT SFA Architects
PROJECT NAME EPA Retaining Wall
PROJECT LOCATION Clifton, OH

BORING # B-1
ALT & WITZIG FILE # 17CN0232

DRILLING and SAMPLING INFORMATION

Date Started 9/11/17 Hammer Wt. 140 lbs.
Date Completed 9/11/17 Hammer Drop 30 in.
Boring Method HSA Spoon Sampler OD 2 in.
Driller D.Frazier/R.Bush Rig Type D-50 Track ATV

TEST DATA

Boring Method		HSA	Spoon Sampler OD		2 in.									
Driller		D.Frazier/R.Bush		Rig Type		D-50 Track ATV								
STRATA ELEV.	SOIL CLASSIFICATION		Strata Depth	Depth Scale	Sample No.	Sample Type	Sampler Graphics Recovery Graphics	Ground Water	Standard Penetration Test, N - blows/foot	Qu-tsf Unconfined Compressive Strength	PP-tsf Pocket Penetrometer	Moisture Content % Dry Unit Weight (pcf)	Remarks	
	SURFACE ELEVATION													
		</												

Sample Type

SS - Driven Split Spoon
ST - Pressed Shelby Tube
CA - Continuous Flight Auger
RC - Rock Core
CU - Cuttings
CT - Continuous Tube

Groundwater

○ During Drilling Dry ft.
▼ At Completion Dry ft.

Boring Method

HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
DC - Driving Casing
MD - Mud Drilling



BORING LOG

Alt & Witzig Engineering, Inc.

CLIENT SFA Architects
PROJECT NAME EPA Retaining Wall
PROJECT LOCATION Clifton, OH

BORING # B-2
ALT & WITZIG FILE # 17CN0232

DRILLING and SAMPLING INFORMATION

Date Started 9/11/17 Hammer Wt. 140 lbs.
Date Completed 9/11/17 Hammer Drop 30 in.
Boring Method HSA Spoon Sampler OD 2 in.
Driller D.Frazier/R.Bush Rig Type D-50 Track ATV

TEST DATA

STRATA ELEV.	SOIL CLASSIFICATION	Strata Depth	Depth Scale	Sample No.	Sample Type Sampler Graphics Recovery Graphics	Ground Water	Standard Penetration Test, N - blows/foot	Qu-tsf Unconfined Compressive Strength	PP-tsf Pocket Penetrometer	Moisture Content % Dry Unit Weight (pcf)	Remarks
	SURFACE ELEVATION										
				1	SS		8		2.5	20.4	
			5	2	SS		7		2.5	20.4	
	Brown, Medium Stiff CLAY with Gravel (FILL)			3	SS		5		1.5	23.8	
			10	4	SS		7				2 Attempts, No Recovery
		12.0									
			15	5	SS		6		1.5	23.1	
	Brown, Medium Stiff CLAY with Gravel										
			20	6	SS		5		1.5	21.2	
		21.0									
	End of Boring at 21 feet										

Sample Type

SS - Driven Split Spoon
ST - Pressed Shelby Tube
CA - Continuous Flight Auger
RC - Rock Core
CU - Cuttings
CT - Continuous Tube

Groundwater

○ During Drilling 20 ft.
▽ At Completion Dry ft.

Boring Method

HSA - Hollow Stem Augers
CFA - Continuous Flight Augers
DC - Driving Casing
MD - Mud Drilling



BORING LOG

Alt & Witzig Engineering, Inc.

CLIENT SFA Architects
 PROJECT NAME EPA Retaining Wall
 PROJECT LOCATION Clifton, OH

BORING # B-3
 ALT & WITZIG FILE # 17CN0232

DRILLING and SAMPLING INFORMATION

Date Started 9/11/17 Hammer Wt. 140 lbs.
 Date Completed 9/11/17 Hammer Drop 30 in.
 Boring Method HSA Spoon Sampler OD 2 in.
 Driller D.Frazier/R.Bush Rig Type D-50 Track ATV

TEST DATA

STRATA ELEV.	SOIL CLASSIFICATION SURFACE ELEVATION	Strata Depth	Depth Scale	Sample No.	Sample Type Sampler Graphics Recovery Graphics	Ground Water	Standard Penetration Test, N - blows/foot	Qu-tsf Unconfined Compressive Strength	PP-tsf Pocket Penetrometer	Moisture Content % Dry Unit Weight (pcf)	Remarks
	TOPSOIL (6")	0.5									
				1	SS		23		4.5	15.9	
	Brown and Gray, Very Stiff CLAY with Gravel and Brick (FILL)		5	2	SS		9				2 Attempts, No Recovery
		8.5		3	SS		9		3.0	14.8	
			10	4	SS		10		2.5	18.7	
	Brown, Very Stiff Sandy CLAY with Gravel		15	5	SS		14		3.8	15.9	
		21.0	20	6	SS		15		3.5	14.4	
	End of Boring at 21 feet										

Sample Type

SS - Driven Split Spoon
 ST - Pressed Shelby Tube
 CA - Continuous Flight Auger
 RC - Rock Core
 CU - Cuttings
 CT - Continuous Tube

Groundwater

○ During Drilling Dry ft.
 ▼ At Completion Dry ft.

Boring Method

HSA - Hollow Stem Augers
 CFA - Continuous Flight Augers
 DC - Driving Casing
 MD - Mud Drilling

GENERAL NOTES

SAMPLE IDENTIFICATION

The Unified Soil Classification System is used to identify the soil unless otherwise noted.

SOIL PROPERTY SYMBOLS

- N: Standard "N" penetration: Blows per foot of a 140 pound hammer falling 30 inches on a 2 inch O.D. split-spoon.
- Qu: Unconfined compressive strength, TSF
- Qp: Penetrometer value, unconfined compressive strength, TSF
- Mc: Water content, %
- LL: Liquid limit, %
- PL: Plastic limit, %
- Dd: Natural dry density, PCF
- : Apparent groundwater level at time noted after completion

DRILLING AND SAMPLING SYMBOLS

- SS: Split-spoon - 1 3/8" I.D., 2" O.D., except where noted
- ST: Shelby tube - 3" O.D., except where noted
- AU: Auger sample
- DB: Diamond bit
- CB: Carbide bit
- WS: Washed sample

RELATIVE DENSITY AND CONSISTENCY CLASSIFICATION

<u>TERM (NON-COHESIVE SOILS)</u>	<u>BLOWS PER FOOT</u>
Very loose	0 - 4
Loose	5 - 10
Firm	11 - 30
Dense	31 - 50
Very Dense	Over 50

<u>TERM (COHESIVE SOILS)</u>	<u>Qu (TSF)</u>
Very soft	0 - 0.25
Soft	0.25 - 0.50
Medium	0.50 - 1.00
Stiff	1.00 - 2.00
Very Stiff	2.00 - 4.00
Hard	4.00+

PARTICLE SIZE

Boulders	8 in.(+)	Coarse Sand	5 mm-0.6 mm	Silt	0.075 mm - 0.005 mm
Cobbles	8 in. - 3 in.	Medium Sand	0.6mm-0.2 mm	Clay	0.005mm(-)
Gravel	3 in. - 5 mm	Fine Sand	0.2mm-0.075 mm		